

## FURTHER ANALYSIS OF SOVIET DATA

### ON MORTALITY AND FERTILITY

Robert J. Myers

A PREVIOUS article (1) indicated that, based on the limited data available, mortality in the U.S.S.R. in recent years was significantly higher than in the United States, and conversely that fertility was lower. These conclusions were in contrast to certain statements made by Soviet officials that were based on comparison of the so-called crude rates (obtained by dividing the number of deaths or births in a year by the average total population during the year) rather than by the technically correct method of standardizing by age and sex to take into account the different demographic structures of the two countries. The analysis was necessarily preliminary and tentative because virtually the only published data available from the Soviet Union were the crude rates. Standardization was performed on the basis of population estimates for the U.S.S.R. made by the U.S. Bureau of the Census (2). In summary, it was found that current Soviet mortality, as reported, was about 25 percent higher than in the United States, while fertility was about 24 percent lower.

These findings were considered by a Soviet demographer, Prof. A. M. Merkov of the N. A. Semasko Institute of Organization of Health Protection and History of Medicine, Moscow (3). Merkov agreed with the general principle that comparisons of mortality and fertility

must be on a standardized basis rather than using the crude rates. However, using certain published data derived from the 1959 Soviet census (4), he obtained opposite conclusions, which are summarized as follows:

*"Contrary to Myers' claims, correctly conducted demographic analysis serves to confirm that, differences in age composition notwithstanding, birth and fertility rates are higher in the USSR, and mortality lower, than in the USA. Other most highly developed capitalist countries are not even worth mentioning, since birth rates in these countries, just as crude and marital fertility rates, are lower, while standardized death rates are higher, than in the USA. Consequently, reproduction processes of the USSR population furnish evidences of higher prosperity in the USSR than in the most highly developed capitalist countries."*

Merkov claims that the results obtained previously were due to the "wrong data on the age-composition of the U.S.S.R. population, calculated by the U.S. Bureau of the Census." It is the purpose of this article to consider the claims made in the Soviet article and to present further analysis on the basis of the more detailed Soviet data now available from reports on their 1959 census.

#### Analysis of Population Estimates of U.S.S.R.

Since Merkov claims that the previous analysis was in error because of using "incorrect" estimates of Soviet population made by the U.S. Bureau of the Census, it will be worthwhile examining how these estimates compare with the reported data for the Soviet census taken on January 15, 1959. Estimates of U.S.S.R. population were published by the U.S.

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*Mr. Myers is chief actuary, Social Security Administration, Department of Health, Education, and Welfare. This paper was written in answer to comments by Prof. A. M. Merkov of the N. A. Semasko Institute of Organization of Health Protection and History of Medicine, Moscow, concerning a previous paper, the Analysis of Mortality and Fertility Data of the Soviet Union.*

Bureau of the Census as of January 1, for 1955, 1956, and 1960 (as well as certain future years). Access can now be had to the Bureau's unpublished figures relating to January 1, 1959, a date comparable with the Soviet census. There might, however, be some objection to using these figures for analytical purposes, because they were not published before the release of the official Soviet census data. Accordingly, a purely mathematical estimate for the U.S.S.R. population on January 1, 1959, as been attempted from the published estimates for 1955 and 1960.

In brief, the 1959 estimates were obtained by the cohort-projection method, for males and females separately. The data for quinquennial age groups from 0-4 to 60-64 years in 1955 and the corresponding ones 5 years older in 1960 were linearly interpolated to obtain the number in each such cohort on January 1, 1959. Specifically, the population aged 4-8 in 1959 was taken as 20 percent of those aged 0-4 in 1955, plus 80 percent of those aged 5-9 in 1960. For the terminal group, aged 65 and over in 1955 (aged 70 and over in 1960), similar procedure gave estimates for the group aged 69 and over in 1959.

Then the 1959 population in quinquennial age groups running from 5-9 to 60-64 was obtained by linear interpolation on the age groups derived as just described. For example, the population aged 5-9 was taken as 80 percent of the group aged 4-8, plus 20 percent of the group aged 9-13. The group aged 0-4 was obtained by linear interpolation between the number in this age group in 1955 and the number in this age group in 1960. The group aged 65-69 was estimated as a proportion (96 percent for males and 97½ percent for females) of the population aged 64-68; such proportions were based on the U.S. Life Tables for 1949-51. The number aged 70 and over could, of course, then readily be computed by merely subtracting the number at age 69 from the number aged 69 and over.

Table 1 compares the Soviet population according to the 1959 census with the derived estimate, also giving a comparison with the unpublished estimate of the Bureau of the Census for the same date. The derived estimate

presented in this paper is quite close in agreement with the actual Soviet census results, especially when it is considered that there were so little data of recent vintage from which to prepare it. For the total population, the difference was only one-half of 1 percent. Males were overestimated by about 5 percent, and females were underestimated by about 4 percent.

**Table 1. Comparison of U.S.S.R. population in January 1959 as shown by census with derived estimate of U.S. Bureau of the Census**

Age group (years)	Soviet population (in thousands)		Soviet census population as percent of—	
	Reported in Soviet census <sup>1</sup>	Derived estimate <sup>2</sup>	Derived estimate	Unpublished estimate <sup>3</sup>
<b>Total males <sup>4</sup>...</b>	<b>94, 050</b>	<b>99, 439</b>	<b>94. 6</b>	<b>94. 7</b>
0-9.....	23, 608	23, 216	101. 7	100. 1
10-19.....	16, 066	17, 513	91. 8	92. 9
20-24.....	10, 056	10, 225	98. 3	100. 1
25-29.....	8, 917	8, 678	102. 8	103. 6
30-34.....	8, 611	9, 413	91. 5	87. 0
35-39.....	4, 528	5, 806	78. 0	83. 4
40-44.....	3, 998	4, 074	98. 1	103. 1
45-49.....	4, 706	4, 770	98. 7	96. 7
50-54.....	4, 010	4, 714	85. 0	84. 0
55-59.....	2, 906	4, 012	72. 4	72. 0
60-69.....	4, 099	4, 629	88. 6	90. 2
70 and over...	2, 541	2, 389	106. 4	106. 7
<b>Total females <sup>4</sup>...</b>	<b>114, 777</b>	<b>110, 342</b>	<b>104. 0</b>	<b>104. 1</b>
0-9.....	22, 755	22, 190	102. 5	101. 0
10-19.....	15, 742	16, 876	93. 3	94. 4
20-24.....	10, 287	9, 859	104. 3	106. 4
25-29.....	9, 273	8, 528	108. 7	109. 8
30-34.....	10, 388	9, 763	106. 4	102. 9
35-39.....	7, 062	7, 602	92. 9	95. 3
40-44.....	6, 410	6, 478	99. 0	101. 8
45-49.....	7, 558	7, 323	103. 2	100. 7
50-54.....	6, 437	6, 327	101. 7	102. 3
55-59.....	5, 793	5, 179	111. 9	111. 6
60-69.....	7, 637	6, 372	119. 9	121. 8
70 and over...	5, 431	3, 845	141. 2	141. 5
<b>Grand total <sup>4</sup>...</b>	<b>208, 827</b>	<b>209, 781</b>	<b>99. 5</b>	<b>99. 7</b>

<sup>1</sup> From reference 4.

<sup>2</sup> See text for description of method of making derived estimate from the available published figures for 1955 and 1960.

<sup>3</sup> Unpublished estimates for January 1959 made by the U.S. Bureau of the Census on a basis consistent with the available published figures for 1955 and 1960 (reference 2).

<sup>4</sup> Including those reported as of unknown age (4,000 males and 4,000 females).

As might be expected, due to the catastrophic war losses (and also due to the necessarily approximate procedure adopted to derive the 1959 population estimates), there were sizable fluctuations for the individual age groups. Most noteworthy were the following: Males were significantly overestimated at ages 35-39 and 50-69, and were somewhat underestimated at ages 70 and over. Females were underestimated at all ages except 10-19 and 35-44 (even here the difference was only about 5 percent), with the most significant underestimates occurring at ages 25-34 and ages 55 and over (particularly, at ages 70 and over, where there was an excess of more than 40 percent). The same general tendencies appear when the Soviet census data are compared with the U.S. Bureau of the Census figures for 1959 (as shown in the last column of table 1).

### Merkov's Mortality Analysis

The mortality analysis made by Merkov used as its basis the 1958 age-specific rates for both sexes combined (5) that were issued in conjunction with data from the 1959 Soviet census, as shown in the first column of table 2. These were available by quinquennial age groups up to age 70 and then for the age group 70 and over. He applied these rates to the 1958 mid-year U.S. population by age and sex and obtained a total number of "expected" deaths (1,499,000). The latter figure is 9.0 percent lower than the registered deaths in the United States in 1958 (1,647,000). Accordingly, Merkov drew the conclusion that the standardized U.S. death rate in 1958 was 7.9 per 1,000, as against the U.S.S.R. rate of 7.2 per 1,000.

One basic weakness in the above analysis is that the age-specific death rates for the U.S.S.R. are not available separately by sex. It is, of course, well known that for a particular age group, females have significantly lower mortality than males. The Soviet census for 1959 showed that only up to age 30 was there a normal balance between males and females—somewhat more than 50 percent men at the youngest ages, declining slowly to considerably less than 50 percent at the oldest ages, but remaining close to 50 percent during most of the lifespan, at least up to age 60. Beyond age 30, the

**Table 2. Comparison of age specific mortality rates of the U.S.S.R. and the United States, 1958**

Age group (years)	Mortality rate (per thousand)		U.S.S.R. mortality rates as percentage U.S. rate	Percentage of males in U.S.S.R. 1959 census <sup>1</sup>
	U.S.S.R. <sup>1</sup>	U.S. <sup>2</sup>		
0-4-----	11.8	6.9	171	<sup>3</sup> 50.9
5-9-----	1.1	.5	220	<sup>3</sup> 50.9
10-14-----	.8	.4	200	<sup>3</sup> 50.5
15-19-----	1.3	.9	144	<sup>3</sup> 50.5
20-24-----	1.8	1.2	150	49.4
25-29-----	2.2	1.3	169	49.0
30-34-----	2.6	1.6	162	45.3
35-39-----	3.1	2.2	141	39.1
40-44-----	4.1	3.5	117	38.4
45-49-----	5.4	5.4	100	38.4
50-54-----	8.0	8.7	92	38.4
55-59-----	10.9	12.6	86	33.4
60-64-----	16.9	19.6	86	<sup>3</sup> 34.9
65-69-----	23.5	31.8	74	<sup>3</sup> 34.9
70 and over..	62.4	72.9	86	31.9
All ages--	7.2	7.0	103	45.0

<sup>1</sup> From reference 4.

<sup>2</sup> Rates by age and sex from reference 5 adjusted (a) for each quinquennial age group, for sex composition of U.S.S.R. population, (b) for age group 70 and over, for age-sex composition of U.S.S.R. population, and (c) for all ages, for age distribution of U.S.S.R. population (see text).

<sup>3</sup> Data given for age groups 0-9, 10-19, and 60-69; same proportion assumed to apply to the two quinquennial age groups within each of the decennial age groups.

proportion of men in the Soviet census was abnormally low, undoubtedly due to war losses (see last column of table 2).

The effect of an abnormally low proportion of men on age-specific mortality rates for both sexes combined can be illustrated by considering U.S. data for 1958 for persons aged 55-59. The male death rate was 18.7 per 1,000, and the female death rate was 9.6 per 1,000. The U.S. sex proportion for this age group in 1958 was 49.1 percent males, as compared with a corresponding figure of 38.4 percent in the U.S.S.R. The mortality rate for both sexes combined (obtained by weighting the male and female death rates by the proportions of each sex) was 8.7 per 1,000 on the basis of the Soviet sex distribution, as compared with 9.3 per 1,000 on the basis of the U.S. distribution. Thus, in this instance, the use of an age-specific death rate for both sexes combined that is derived on the basis of the Soviet sex composition under-

states mortality for a population like that of the United States, with more normal sex distribution, by about 7 percent.

### Proper Analysis of Mortality

In order to make a proper comparison of U.S.S.R. and U.S. mortality rates, it is necessary to weight the U.S. age-specific rates by the sex proportions prevailing in the Soviet Union. Adjustment in the rate for the combined group aged 70 and over is also necessary so as to allow for differences in both age and sex composition. It is unfortunate, for purposes of mortality analysis, that the published Soviet data at ages 70 and over were lumped together instead of being subdivided into quinquennial age groups at least up to age 85, since a high proportion of all deaths occur at ages 70 and over (about one-third for the U.S.S.R. in 1958). Adjustment of the U.S. age-specific death rates for ages 70 and over is necessary because the proportion of females in this age group in the United States is lower than in the U.S.S.R. and, further, because the estimated average age for this group is higher for the United States than for the U.S.S.R.; otherwise the U.S. rate for both sexes combined would be overstated relative to the U.S.S.R. rate.

These adjusted U.S. rates are shown in the second column of table 2. The rate for ages 70 and over was obtained (see table 3) by weighting the age-specific U.S. rates by sex for age groups 70-74, 75-79, 80-84, and 85 and over by the corresponding estimated percentage distribution of the U.S.S.R. population aged 70 and over. The sex distribution was based on the Soviet census data, whereas the age distribution for each sex was obtained from the published figures of the French demographer, J.-N. Biraben (6) since no such data have been released by the Soviet Union.

Current Soviet mortality is about double that of the United States up to age 15 and is then about 1.5 times as high up to age 40. The ratio then declines until for ages 55 and over Soviet mortality is reported to be about 15 percent lower than that of the United States.

Precise analysis of age differentials in mortality can readily be made, but there is some

problem in standardizing two sets of age-specific mortality rates. The standardizing population selected can have a significant effect, especially when, as in this instance, there is such a shifting differential between the two sets of rates. If the standardizing population is that of the U.S.S.R. (as in table 2), the resulting conclusion is that, for all ages combined, current mortality in the U.S.S.R. appears to be only about 3 percent higher than in the United States.

**Table 3. Derivation of mortality rate for the United States in 1958 for ages 70 and over combined, based on U.S.S.R. age-sex composition<sup>1</sup>**

Age group	Men		Women	
	Mortality rate <sup>2</sup> (per thousand)	Percent in group <sup>1</sup>	Mortality rate <sup>2</sup> (per thousand)	Percent in group <sup>1</sup>
70-74.....	62.5	16.32	39.6	33.38
75-79.....	86.6	9.46	60.2	20.33
80-84.....	136.4	4.48	110.3	10.34
85 and over....	203.6	1.61	201.2	4.08
70 and over.....	-----	31.87	-----	68.13

<sup>1</sup> Percent by sex (reference 4) subdivided by age by distribution for each sex derived for 1958 by averaging those for 1956 and 1961 from reference 6.

<sup>2</sup> Reference 5.

NOTE: Weighted mortality rate based on U.S.S.R. proportions in each age-sex group=72.9 per 1,000 (comparable rate based on U.S. age-sex composition is 81.4 per 1,000).

This result is at variance with that derived in my previous paper, partly because the Soviet data now available report such low death rates at the advanced ages and also for the oldest age group show such a large proportion of women, who have much lower mortality than aged men. Furthermore, the crude death rate for the U.S.S.R. used previously was for 1956; the corresponding rate reported for 1958, which is the underlying basis for the figures in the first column in table 2, is 7 percent lower, whereas U.S. mortality (including the crude death rate) changed little during 1956-58.

On the other hand, if the U.S. population in 1958 had been taken as the standardizing base, the crude death rate based on U.S. mortality

rates is 9.46 per 1,000, whereas that based on the Soviet mortality rates is 9.16 per 1,000, or 3 percent lower. In the latter case, Soviet mortality appears slightly lower whereas when the U.S.S.R. population was used as the standardizing base, the reverse result was obtained. Such findings could be expected in view of the facts that the U.S. age distribution is older than that of the Soviet Union and that U.S. mortality is lower at the younger ages and higher at the older ages than is Soviet mortality.

On the whole then, the conclusion seems reasonable that on the basis of reported Soviet age-specific mortality rates, aggregate mortality in the two countries is about the same. The United States clearly has a wide advantage at the younger ages, although at the older ages the reported Soviet rates are significantly lower. The latter, however, may be subject to considerable question because not only are reported Soviet mortality rates at the older ages lower than those in the U.S., but also they are below those of countries generally having the lowest mortality in the world, such as Norway.

In comparison with recent Norwegian experience, Soviet mortality is about twice as high at all ages up to about 45. The ratio declines somewhat thereafter, but Soviet mortality is still about one-third higher for ages 55-64. This differential is about 10 percent for ages 65-69, but for ages 70 and over, the situations is reversed—Soviet mortality is reported to be about 5 percent lower. In the absence of more detailed data from the U.S.S.R., it is indeed surprising—and leaves room for doubt—that reported mortality rates at the older ages are so low. Quite obviously, if these rates were higher, the comparison of aggregate mortality as between the United States and U.S.S.R. would be significantly affected, in favor of the United States.

### **Analysis of Fertility**

My previous paper (1) indicated that the comparison of the crude birth rates, which are about the same in the two countries, is not of significance because of differences in the age compositions of the female populations. The 1958 rates were 24.3 per 1,000 for the United States and 25.3 for the U.S.S.R. The analysis

indicated that Soviet fertility was actually about 24 percent lower than that for the United States after standardization for age (on the basis of the estimated U.S.S.R. distribution).

Merkov modified the crude birth rates of the two countries by relating them to the female population in the reproductive ages (20 to 49) resulting in fertility rates of 103.7 for the U.S.S.R. and 121.5 for the United States. This still showed a differential of 17 percent in favor of the United States. Merkov then attempted in his analysis to obtain marital fertility rates by taking into account the proportion of women who are married. The published results of the Soviet census of 1959 state that 55.2 percent of the women aged 15 and over are married, as against a corresponding figure of 66.0 percent for the United States in 1958. Merkov adjusted for this factor, obtaining marital fertility rates of 198.7 per 1,000 for the U.S.S.R., as against 184.1 per 1,000 for the United States, or a differential of 8 percent in favor of the Soviet Union.

The error in the Merkov analysis of marital fertility rates is that he has adjusted for the marital proportions for all women aged 15 and over, rather than restricting the adjustment factor to data for women of childbearing ages only. It seems likely that, because of the high proportion of women in the Soviet Union at ages 35 and over, the proportions married at those ages are relatively low. On the other hand, this would probably not be the case at the most important childbearing ages (20 to 35), at which the sex proportions are relatively normal (see last column of table 2) and relatively close to those in the United States. In other words, if the marital proportions for women in the U.S.S.R. were available by age (as strangely enough they are for men), it is likely that there would be relatively little difference in these proportions as between the two countries. Accordingly, any marital status correction of crude fertility rates related to women in the childbearing ages would be relatively negligible, and there would still be a differential of about 15 percent in the direction of U.S. fertility being higher than Soviet fertility. More refined analysis similar to that of the previous paper might still show a differential of as much as 20-25 percent.

## REFERENCES

- (1) Myers, R. J.: Analysis of mortality and fertility data of the Soviet Union. Pub. Health Rep. 74: 975-981, November 1959.
- (2) Campbell, A. A., and Brackett, J. W.: Estimates and projections of the population of the U.S.S.R.: 1950 to 1976. International Population Reports. Series P-35, No. 52. U.S. Bureau of the Census, Washington, D.C., May 1959.
- (3) Merkov, A. M.: Comparing measures of mortality and fertility in the U.S.S.R. and capitalist countries, *Sovetskoe Zdravookhranenie*, No. 2, pp. 68-72 (1961).
- (4) Pravda, Moscow, February 4, 1960.
- (5) U.S. National Office of Vital Statistics: Vital statistics of the United States, 1958, vol. I, p. 6-17 (table 6-D). U.S. Government Printing Office, Washington, D.C., 1960.
- (6) Biraben, J.-N.: Essai sur l'évolution démographique de l' U.R.S.S. Population (National Institute of Demographic Studies, Paris) 13: 29-62, June 1958 (special number).

## Social Welfare: Myth and Fact

*Myth:* Public assistance often goes to "chiselers."

*Fact:* About 5½ million of the 7¼ million persons on public assistance in this country are children, or are aged, blind, or markedly disabled and obviously not "chiselers." Studies show the incidence of fraud in public assistance to be less than 2 percent in Chicago and 1.3 percent in California.

*Myth:* Aid to dependent children encourages illegitimacy.

*Fact:* One out of eight illegitimate children in the country receives assistance through the aid to dependent children program. Of the 2.7 million children in the program, illegitimate children account for about 20 percent.

According to a study of families receiving ADC help in 1958, the average number of children in families in which the father was not married to the mother was 2.2. This was less than the average number for families in which the father was dead, incapacitated, divorced or separated from the mother, or absent in any other circumstance, including desertion.

*Myth:* Public welfare perpetuates dependency. People flock to the State or city that will give them relief; there they stay on relief indefinitely.

*Fact:* The average length of time even a mother with small children receives aid to dependent children is only 2¼ years. Census figures clearly show that people move from places where work is scarce to those where work is available. Studies in New York State and Illinois of newcomers who have become recipients show that they obtain assistance for an average of only 1 year.

# Federal Publications

**Behavior Patterns of Premature Infants.** A nursing study. *PHS Publication No. 840; 1961; by Eileen G. Hasselmeyer; 85 pages; 50 cents.*

This report describes a controlled study at Bellevue Hospital Center in New York City to test the effect of a diaper roll support on the well-being of prematurely born infants.

The first section reviews earlier related literature and discusses briefly the pilot study.

A detailed account of the experimental phase includes a description of specific instruments used in the collection of data on patterns of sleep, vocalization, bodily movement, and feeding behavior. Results of six hypotheses tested to determine the effect of the diaper roll support on these patterns are reported.

Findings suggest implications for nursing service and education as well as for further research in nursing and other disciplines.

**Your Opportunity as a Dietitian or Nutritionist to Serve the Aged.** *PHS Publication No. 882; 1961; leaflet.*

Designed for distribution during display of an exhibit by the same title. Highlights services for nursing homes, home care, day centers, and meals on wheels. Presents questions and answers to aid the dietitian or nutritionist in learning of opportunities for service in her community.

**Medical School Facilities. Planning considerations.** *PHS Publication No. 874; 1961; 56 pages; 45 cents.*

**Medical School Facilities. Planning considerations and architectural guide.** *PHS Publication No. 875; 1961; 185 pages; \$ 1.*

Guidelines for planning up-to-date medical schools are presented in these publications, prepared by the Public Health Service in cooperation with the Ad Hoc Committee on Medical School Architecture sponsored by the Association of Ameri-

can Medical Colleges and the American Medical Association.

They provide identical information on the role and responsibilities of the medical schools and the composition of its faculty and curriculum in relation to requirements for facilities. They also contain identical chapters on construction and operating costs and elements in planning.

Publication No. 875 provides, in addition, detailed technical data regarding architectural and engineering requirements. These data are summarized in Publication No. 874.

**The Public Health Service in Radiological Health.** *PHS Publication No. 887; 1961; 20 pages.*

This pamphlet describes the missions and goals of the Public Health Service's Division of Radiological Health, which is the focus of Federal activities in a nationwide program to develop an increased awareness of the dangers of excessive exposure to radiation and to assure that adequate protective measures are adopted. It also discusses opportunities offered to professional personnel with an interest in radiological health.

**Influenza.** *PHS Publication No. 163 (Health Information Series No. 36); revised 1962; leaflet; 5 cents, \$2.50 per 100.*

Describes cause, spread, and symptoms of influenza. Gives general precautions to be observed and recommends routine annual immunization for high-risk groups, specifically the elderly, chronically ill, and pregnant women.

**Environmental Engineering for the School. A manual of recommended practice.** *PHS Publication No. 856; 74 pages; 50 cents.*

Designed for use by school administrators, educators, school maintenance personnel, and public health workers, this manual attempts to

meet the need for a comprehensive overall statement of basic environmental criteria for schools by which either existing or planned facilities can be evaluated. It gives basic recommendations and standards regarding construction, maintenance, renovation, and physical components of a school plant. Checklists at the end of each chapter serve as a guide in evaluating facilities.

**Development of Present Knowledge About Tuberculosis.** *PHS Publication No. 30-A (Health Information Series No. 33-A); leaflet; 1961; 10 cents, \$7.50 per 100.*

Traces discoveries and developments in the fight against tuberculosis through the centuries. Discusses medical research and public health aspects of the continuing search for new weapons and techniques.

**Soviet Medical Research Related to Human Stress.** *PHS Publication No. 853; 121 pages; 40 cents.*

Undertaken as part of the Russian Scientific Translation Program of the Public Health Service, this booklet reviews literature on the physiological and psychological effects of stress on the human organism. It is intended to give the non-Russian-reading scientist a conspectus of Soviet thinking, experimentation, and data in this field.

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